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BIOLOGICAL EVALUATION

ASH GROVE CEMENT MAINTENANCE DREDGING

Corps Reference No. 200100155
HUC 17110013

Prepared for

Ash Grove Cement
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1 INTRODUCTION

Ash Grove Cement plans to carry out maintenance dredging at its barge off-loading facility on the east side of the Duwamish Waterway, Seattle, Washington (Figure 1). The purpose of the project is to maintain adequate water depths for barges using the facility. Approximately 600 cubic yards (cy) of material will be dredged to restore the berthing area to a depth of -25 feet mean lower low water (MLLW). The berthing area was last dredged in 2003 under U.S. Army Corps of Engineers (Corps) Permit No. 2001-1-00155.

The area to be dredged is approximately 45 by 65 feet, or 2,925 ft^2. The project will not expand the previously maintained area.

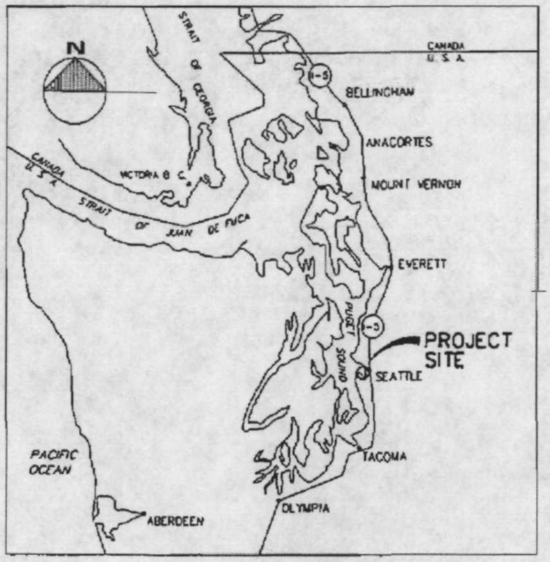
Listed and proposed species that could occur in the project area include Puget Sound chinook salmon, bull trout, and bald eagle. These species are addressed in this BE pursuant to Section 7(a)(2) of the Endangered Species Act (ESA) are listed in Table 1 on the following page.

Steller sea lions, marbled murrelets, leatherback sea turtles, humpback whales, and orca whales appear on ESA lists of species potentially occurring in the action area. The life histories and distribution of these species were analyzed, and it was determined that based on the heavily industrialized nature of the site and the lack of habitat or prey base, these species do not occur in the action area.

Table 1
Threatened, Endangered, and Candidate Species That May Occur in the Project Area

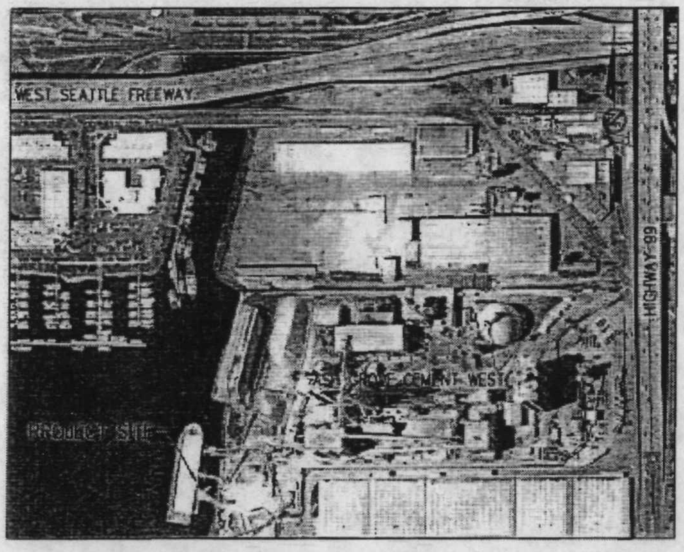
Species	Status	Agency	Effects Determination	Critical Habitat	Critical Habitat Effects Determination
Puget Sound chinook salmon (*Oncorhynchus tshawytscha*)	Threatened (Puget Sound ESU)	NMFS	NLAA	Proposed	No adverse modification
Bull trout (*Salvelinus confluentus*)	Threatened (Coastal-Puget Sound ESU)	USFWS	NLAA	Proposed	No adverse modification
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	NMFS	No effect	None designated in WA	N/A
Steller sea lion (*Eumetopias jubatus*)	Threatened	NMFS	No effect	None designated in WA	N/A
Humpback whale (*Megaptera novaeangliae*)	Endangered	NMFS	No effect	None designated	N/A
Orca whale (*Orcinus orca*)	Proposed Threatened	NMFS	Will not jeopardize	None designated	N/A
Marbled Murrelet (*Brachyramphus marmoratus*)	Threatened	USFWS	No effect	None in project area	N/A
Bald eagle (*Haliaeetus leucocephalus*)	Threatened	USFWS	No effect	None designated	N/A

NLAA=Not likely to adversely affect



VICINITY MAP

TIDAL INFORMATION	
DATUM PLANE	ELEVATION
EXTREME HIGH WATER (EHW)	14.50
MEAN HIGHER HIGH WATER (MHHW)	11.20
MEAN HIGH WATER (MHW)	10.30
MEAN (HALF) TIDE LEVEL	6.55
MEAN SEA LEVEL	6.07
MEAN LOW WATER (MLW)	2.80
MEAN LOWER LOW WATER (MLLW)	0.00
EXTREME LOW WATER (ELW)	-4.50



SITE LOCATION

PURPOSE: TO ENSURE CONTINUED SAFE OPERATION OF AN EXISTING BARGE LOADING FACILITY

DATUM: 0.0' M.L.L.W.

ADJACENT PROPERTY OWNERS:
1) PORT OF SEATTLE
2) INTERNATIONAL BELT & RUBBER

ASH GROVE CEMENT

PROJECT LOCATION

ASH GROVE CEMENT WEST, INC
3801 E MARGINAL WAY S.
SEATTLE, WA 98134

PROPOSED: PROPOSED REMOVAL OF EXCESS MATERIAL

IN: DUWAMISH WATERWAY
AT: SEATTLE, KING COUNTY, WASHINGTON
APPLICATION BY: ASH GROVE CEMENT WEST, INC.

SHEET 1 **of** 3 **DATE:** APRIL 2005

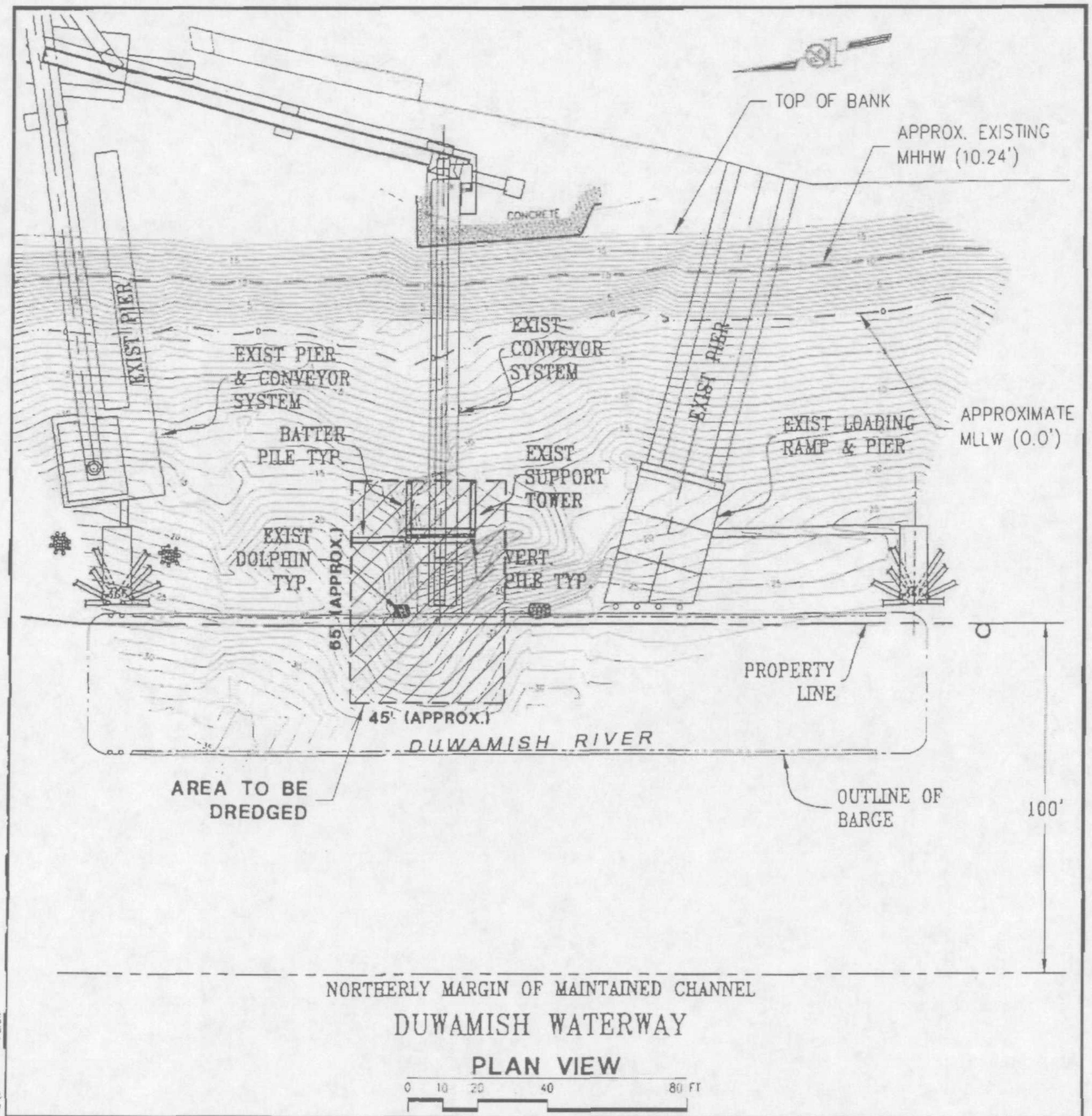
AGC2C000489

2 PROJECT DESCRIPTION

2.1 Project Setting

Ash Grove Cement is located on the shoreline of the Duwamish Waterway. The property is currently used as a concrete manufacturing facility. There is a barge berthing facility at the shoreline for unloading of sand, gravel, and limestone required for the production of concrete. A conveyor system transports these materials to the upland storage and processing facility (Figure 2).

The Duwamish Waterway is highly industrialized and the project area lies within the Duwamish Diagonal Superfund Site.



PURPOSE: TO ENSURE CONTINUED SAFE OPERATION OF AN EXISTING BARGE LOADING FACILITY **DATUM:** 0.0' M.L.L.W. **ADJACENT PROPERTY OWNERS:** 1) PORT OF SEATTLE 2) INTERNATIONAL BELT & RUBBER	**ASH GROVE CEMENT** **PLAN VIEW** ASH GROVE CEMENT WEST, INC 3801 E MARGINAL WAY S. SEATTLE, WA 98134	**PROPOSED:** PROPOSED REMOVAL OF EXCESS MATERIAL **IN:** DUWAMISH WATERWAY **AT:** SEATTLE, KING COUNTY, WASHINGTON **APPLICATION BY:** ASH GROVE CEMENT WEST, INC. **SHEET** 2 **of** 3 **DATE:** APRIL 2005

AGC2C000491

2.2 Project History

Ash Grove Cement has previously received permits for maintenance dredging at its facility. The material to be dredged consists mainly of spilled material. Since dredging in 2003, Ash Grove Cement has invested more than $165,000 in improvements to its conveyor system to significantly reduce the amount of material spilled during barge loading.

Ash Grove Cement listed measures they will take to reduce spillage in a letter to the Corps dated September 17, 2002. Implementation of these measures is Condition 7E of the Corps dredging permit no. 201-1-00155, dated January 15, 2003. The letter is attached as Appendix B and includes completed improvements, annual monitoring, and future improvements.

The following improvements have been made:

- A large hopper has been installed with a vertical front wall that allows increased barge conveyor extension. The new hopper has also been supplied with skirting to reduce spillage.
- The barge-mounted conveyor has been modified to increase conveyor extension by about 14 inches to reduce spillage.
- New covers have been installed over the dock conveyor to reduce dust emission and spillage from the conveyor during summer months.
- A new pre-cleaner and secondary cleaner system has been installed on the dock conveyor belt. This will significantly reduce carryback spillage from the dock conveyor belt.
- The first of the annual monitoring bathymetry surveys has been completed.

2.3 Construction

2.3.1 Methods

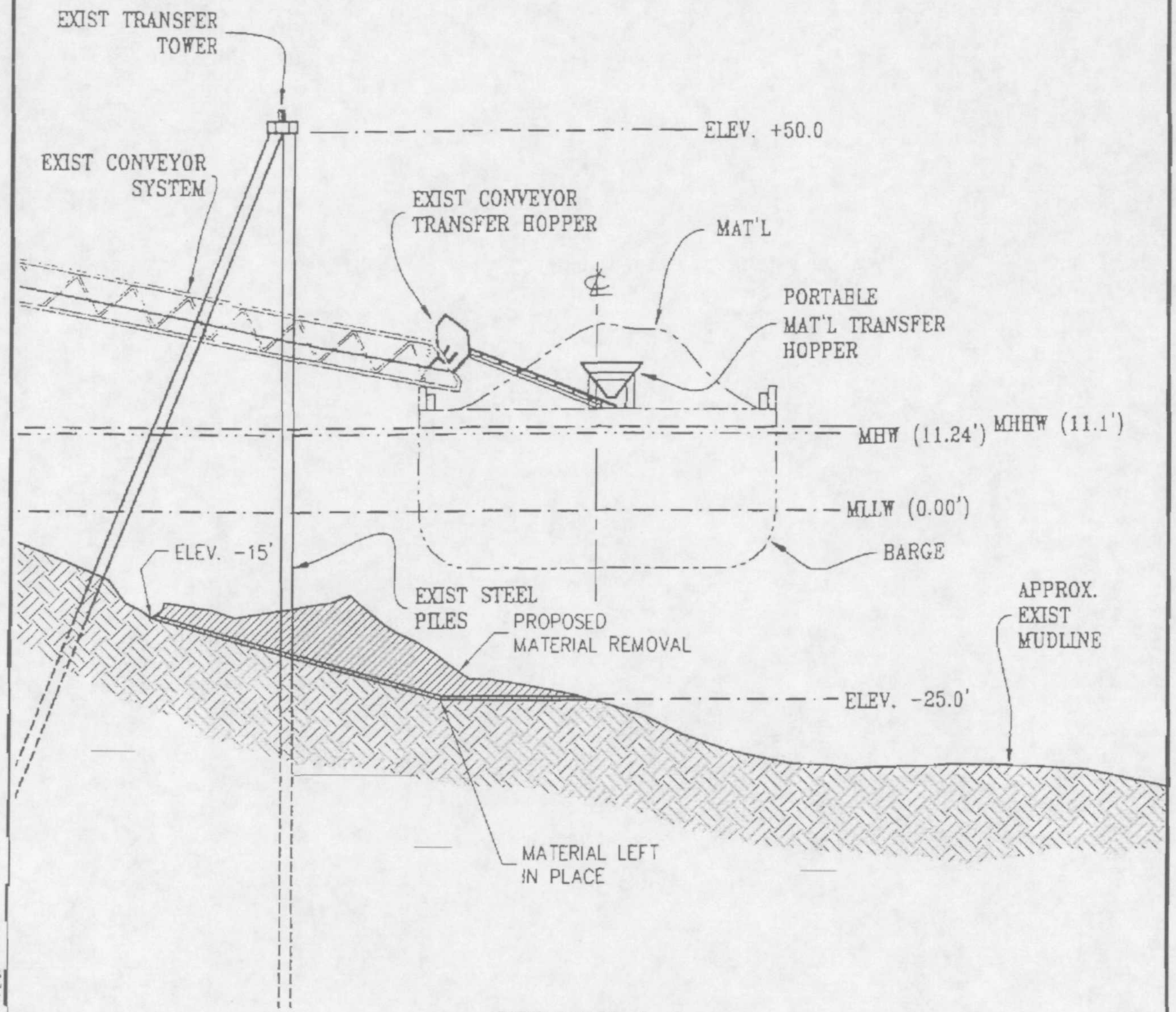
The long-term maintenance dredging plan for Ash Grove Cement is as follows:

2003	Initial dredging	600 cy	Completed
2005	Maintenance dredge	600 cy	
2007	Maintenance dredge	600 cy	
2009	Maintenance dredge	600 cy	
2011	Maintenance dredge	600 cy	
2013	Maintenance dredge	600 cy	
	Total dredge volume	3,600 cy	

The Corps dredging permit states that a Biological Evaluation (BE) will be prepared prior to each maintenance dredging event. This BE covers the 2005 maintenance dredging of 600 cy.

The area to be dredged is shown in Figures 2 and 3. The area to be dredged is approximately 45 by 65 feet, or 2,925 ft^2 (0.07 acre). Dredging will be limited to recently deposited spilled material between -10 and -25 feet MLLW. A 1-foot buffer layer of spilled material will be left in place over the native sediment surface, as required by the Dredged Material Management Program (DMMP) agencies.

A 4-foot clamshell dredge bucket mounted on a barge will be used. Dredged material will be dewatered on the barge, then the barge will be towed to another location on the Duwamish Waterway where material will be off-loaded onto trucks. It is necessary to off-load the dredged material at another location because the Ash Grove Cement conveyors are not able to handle damp material. The material will be delivered back to the cement facility and reused as component materials for cement.



SECTION A-A

0 10 20 40 80 FT

PURPOSE: TO ENSURE CONTINUED SAFE OPERATION OF AN EXISTING BARGE LOADING FACILITY

DATUM: 0.0' M.L.L.W.

ADJACENT PROPERTY OWNERS:
1) PORT OF SEATTLE
2) INTERNATIONAL BELT & RUBBER

ASH GROVE CEMENT

CROSS-SECTION

ASH GROVE CEMENT WEST, INC
3801 E MARGINAL WAY S.
SEATTLE, WA 98134

PROPOSED: PROPOSED REMOVAL OF EXCESS MATERIAL

IN: DUWAMISH WATERWAY
AT: SEATTLE, KING COUNTY, WASHINGTON
APPLICATION BY: ASH GROVE CEMENT WEST, INC.

SHEET 3 **of** 3 **DATE:** APRIL 2005

2.4 Project Schedule

Dredging will be scheduled between October 1, 2005 and February 15, 2006. Dredging will last approximately 3 to 5 days.

2.4.1 Conservation Measures

Best Management Practices (BMPs) were prescribed by the Corps in December 2002 (Permit No. 2001-1-00155), prior to the initial dredging phase, to improve the accuracy of the dredging operation, minimize sediment disturbance, and specify disposal method of dredged material. These BMPs are listed below:

1. Permit Conditions
   - A. All permit conditions shall be complied with (including that of observing the allowable in-water work window of October 1 to February 15, when salmonids are not likely to be present or occur in low numbers).
   - B. Contractor shall be provided copies of permits in advance of mobilization to site.
   - C. Project engineer, or his representative, shall be on site during dredging to monitor permit compliance.
2. Dredge Depth and Positioning
   - A. Contractor shall be provided a current bathymetry survey drawing that should best represent the bathymetry of the site.
   - B. Project engineer shall provide plans showing project corners and bathymetry indicating the proscribed dredge depth.
   - C. Dredge supervisor will use GPS or beach survey points to locate project corners. Position of equipment will be re-checked as frequently as necessary to assure work does not extend beyond permitted plan area or depth. Horizontal accuracy of the GPS will also be checked.
   - D. To assure that removed material does not exceed approved dredge depth, clamshell control cables shall be marked with highly visible paint to guide the dredge operator. Standard dredge tolerance is maximum one foot overdredge.
   - E. Dredge operator shall regularly check tide boards and make any necessary changes to operation in order to compensate for changes in tidal elevation.

   F. Dredge operator shall take care not to exceed authorized dredge cut depth or disturb native sediment. Clamshell bucket shall not disturb native sediment.
   G Accuracy of dredging is more important than the speed of material removal.
   H. Post-dredge bathymetry will be conducted to provide condition drawing and possibly calculate volume of material removed.

3. Control of Sediment Disturbance and Turbidity
   A. With each grab of the clamshell, dredge material shall be completely removed and material placed on the deck barge. Bucket shall make a complete cycle with each pass of the bucket. The clamshell bucket will not be dragged over the bottom to level the cut.
   B. Deck barge will have fences to contain dredge material. These may be either barge structure or concrete ecology blocks. Hay bales with filter fabric shall be installed to serve as filters wherever fence is not watertight.
   C. Dredge operator shall lift bucket slowly to facilitate maximum dewatering of the bucket near the water surface to avoid plunging as bucket is raised to deck.
   D. Due to the granular nature of the dredge material, it is not expected that sediments will adhere to the bucket. However, if the dredge supervisor observes that sediments are adhering to the bucket, the bucket shall be rinsed in a tank after each grab/dump cycle. The tank may be constructed of wood, hay bales or concrete ecology blocks and lined with plastic on the deck of the barge. Sediment residue collected in the rinse tank will be settled out and disposed of along with the dredged material as described below.
4. Transfer and Disposal of Dredged Material
   A. All dredged material, gravel or fine-grained sediments, once removed from the water, shall not be returned to the water.
   B. Dredged material shall be dewatered on the deck barge prior to transferring to shore, unless otherwise approved by project engineer or his on-site representative.
   C. Dredged material shall be transferred by clamshell from deck barge to dump trucks at Ash Grove Cement facility.

D. Trucks shall load on a tarp area. All spilled material shall be collected by broom or shovel and prevented from re-entering the waterway or storm water flow.

E. Trucks shall deliver dredged material to Ash Grove Cement plant.

F. All dredged material shall be disposed of by re-introduction as raw material in the cement manufacturing process at the Ash Grove Cement plant. This process uses such high temperatures that any extant contaminants would be destroyed.

3 ENVIRONMENTAL BASELINE

3.1 Action Area

The action area is the defined geographic area directly or indirectly affected by the proposed project. For the purpose of establishing baseline conditions from which to evaluate potential effects of the project physical conditions such as substrate composition and timing were examined. The project component that poses potential impacts to endangered or threatened species and their habitats is dredging, which may result in increased turbidity in the water column.

The action area is all aquatic habitat within 300 feet from dredging and barge unloading activities. This includes the shoreline within 300 feet from each end of the project area. The action area was chosen because, in past experience with numerous other dredging projects in Elliot Bay, projects have routinely maintained compliance with the water quality standards outside a 300-foot radius. In addition, it includes the 200-foot mixing zone allowed by Ecology, per WAC 173-201A-400.

3.2 Physical Indicators

3.2.1 Substrate and Slope

The proposed project will maintain the working depth (-25 feet MLLW) at the berthing facility that was last dredged in 2003. Substrate in the action area consists primarily of sandy silt in the subtidal and shallow subtidal zones, which gives way to steeply sloped (approximately 2H:1V) riprapped banks in the intertidal zone. Slopes in the subtidal zones are typically flatter (see Figure 3). The material to be dredged lies partly on a flat bottom and partly on a gentle slope (see Figure 3).

3.2.2 Salt/Freshwater Mixing

The Duwamish River estuary extends from the mouth of the Duwamish River throughout the lowermost 11 miles, to approximately the confluence with the Black River in Tukwila (City of Seattle 2001). The project area project area is about a mile and a half from the Duwamish River mouth, and highly influenced by both fresh water exiting the Green-Duwamish river system and tidal cycles within Elliott Bay.

3.3 Chemical Indicators

3.3.1 Water Quality

Water quality in the Duwamish Waterway varies depending on location and has been monitored by the King County Streams Monitoring Program since 1996. The closest monitoring station to the project area is located at the Spokane Street Bridge (station 0305, river mile 1/4), within a mile of the project area. Based on the results of these sampling events, temperature and oxygen levels in the waterway have frequently exceeded water quality standards (Kerwin and Nelson 2000). In addition, Section 303(d) of the Clean Water Act (CWA) requires the state to identify water bodies not meeting water quality standards. The Duwamish Waterway and River exceeds the 303(d) standards in the 1998 assessment for dissolved oxygen, pH, sediment bioassay parameters, and the following substances: 1,4-Dichlorobenzene, acenaphthene, arsenic, benzo(ghi)perylene, benzoic acid, bis(2-ethylhexyl) phthalate, butylbenzyl phthalate, cadmium, dibenz(a,h)anthracene, dimethyl phthalate, lead, mercury, pH, phenathrene, phenol, silver, total PCBs, and zinc.

3.3.2 Sediment Quality

Native bottom sediments underlying the dredge prism consist of fluvial deposited sandy silts (Weston 1999). The project area is within a Superfund site. Sediment testing locations nearest the Ash Grove Cement facility show levels above the Puget Sound Dredged Disposal Analysis (PSDDA) Screening Level criteria for metals and pesticides, and levels above the PSDDA bioassay trigger criteria for polychlorinated biphenyls (PCBs) (Ecology 2004). The sediments to be dredged are recently deposited clean gravel, sand, and limestone. To avoid disturbing contaminated sediments, one foot of material will be left in place to prevent disturbance to native sediments.

3.4 Biological Indicators

3.4.1 Prey Species

Epibenthic zooplankton, pelagic calanoid copepods, and terrestrial insects are important prey for juvenile chinook salmon in estuaries (Simenstad et al. 1988; Healey 1991; Weitkamp and Schadt 1982). Epibenthic prey species from the littoral zone are likewise used by juvenile salmonids in the Duwamish estuary and have been documented on all of the substrate types found in, and in close proximity to, the action area (Meyer et al.

1981). These organisms are most abundant on mid- and lower-intertidal soft-bottom habitats.

Benthic infauna are not considered a major source of prey for any life history stage of chinook salmon. Chinook do prey on certain burrowing and tube-dwelling amphipods, but these animals (e.g., *Corophium* sp.) are not typically considered part of the infauna; rather they are considered to be epifaunal, because they often leave their burrows to move about in the water column, where they are captured by juvenile salmonids.

3.4.2 Aquatic Vegetation

There is no eelgrass in the action area. Macroalgae is common throughout the action area and can be found attached to hard substrates such as cobble, rock, riprap, and piling. The material to be dredged is sand, gravel, and limestone at depths between -15 feet MLLW to -25 feet MLLW and is not expected to support aquatic macrophytes.

Dredging is not expected to affect aquatic vegetation in the action area and the project will maintain the current baseline condition.

4 SPECIES OCCURRENCE, EFFECTS ANALYSIS, AND EFFECTS DETERMINATION

4.1 Puget Sound Chinook Salmon (*Oncorhynchus tshawytscha*)

4.1.1 Status

Puget Sound chinook are listed as threatened in Puget Sound. The Duwamish Waterway is used by Puget Sound chinook salmon migrating between the Puget Sound and the Duwamish River.

4.1.2 Critical Habitat

On December 14, 2004, the National Marine Fisheries Service, (NMFS) published proposed rules for designating critical habitat for 13 Evolutionarily Significant Units (ESUs) of Pacific Salmon and Steelhead in Washington, Oregon, and Idaho. This designation includes the Puget Sound ESU of chinook salmon which is currently listed as threatened under the ESA. Critical habitat is designated for areas containing the physical and biological habitat features, or primary constituent elements (PCEs) essential for the conservation of the species or which require special management considerations. PCEs include sites that are essential to supporting one or more life stages of the ESU and which contain physical or biological features essential to the conservation of the ESU. Specific sites and features designated for Puget Sound chinook include the following:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning incubation and larval development.
2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth, and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

4. Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.
5. Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.

The critical habitat proposal for Puget Sound chinook includes 61 occupied watersheds in 18 associated subbasins as well as 19 nearshore marine zones. In setting this designation, the conservation value of each habitat area was considered in the context of the productivity, spatial distribution, and diversity of habitats across the range of five geographical regions of correlated risk. In estuarine areas, the in-shore extent is defined by the line of extreme high water. The proposed offshore extends to the depth of 30 meters (98 feet) relative to MLLW.

The project area falls within Critical Habitat Unit 11, the Duwamish Subbasin. The area is valuable as a migration corridor and as an estuarine transitional zone, though natural cover features are lacking due to extensive shoreline modifications.

4.1.3 Biology and Distribution

Seven studies were reviewed, that focus on adult and juvenile salmon use of the Duwamish River (Salo 1969; Weitkamp and Campbell 1980; Meyer et al. 1981; Weitkamp and Schadt 1982; Warner and Fritz 1995; Taylor et al. 1999; Weitkamp and Ruggerone 2000). Other studies of salmonid use and feeding behavior in specific habitats (Jones & Stokes Associates 1990; Parametrix 1990; Cordell et al. 1997; Cordell et al. 1998), combined with unpublished studies conducted within the area, form the basis for understanding spatial and temporal use of the action area by chinook salmon.

Chinook located in the Duwamish River are most likely spawned from one of the Green River stocks. The name of the river changes from the Green to the Duwamish River at river mile (RM) 11 (where the Black River enters into the mainstem). There are two stocks of fall chinook salmon in the Green/Duwamish system: Green/Duwamish summer/fall chinook and Newaukum Creek summer/fall chinook.

The Green/Duwamish chinook salmon stock has been frequently transferred into other Puget Sound basins in the past and is genetically similar to several other Puget Sound chinook stocks. The origin of the stock is mixed, with natural spawning throughout the river and hatchery production at Soos Creek. Hatchery-produced chinook salmon in the Green River system are not considered part of the Puget Sound ESU that is listed as threatened; therefore, only a portion of the fish passing through the action area are listed under the ESA.

Chinook of all life history stages use the Green/Duwamish River system. Mature salmon migrate through the area to reach upstream spawning grounds, but spawning is unlikely to occur in the project area because it is undesirable spawning habitat. The Green/Duwamish River system is also a migration route for juvenile chinook salmon. When present, these juveniles may use the project area for feeding and holding before entering further into the estuary and/or saltwater (Anchor 2004).

4.1.3.1 Adult and Subadult Timing

Adult chinook migrate through the action area from mid-June through early November, peaking in August (Weitkamp and Ruggerone 2000). Sub-adult chinook (larger than approximately 70-80 mm) could be present in the action area any month of the year. Although there is a range in sizes of fish associated with moving away from the shoreline, chinook approximately 70 to 80 mm in length appear to be fully capable of functioning in the offshore environment. Chinook longer than 70 to 80 mm may still be caught along the marine and estuarine shorelines. At this size, however, they are likely facultative rather than obligate residents of this nearshore habitat relative to feeding and physiology (Healey 1982, 1991).

4.1.3.2 Juvenile Timing

Peak juvenile chinook migration though the Duwamish estuary occurs from May to June. During the months of July through April, few if any juvenile chinook less than approximately 70 to 80 mm in length are present. Small numbers of chinook less than 60 mm long arrive in the freshwater-dominated habitats of the lower Duwamish River in April through May. Length distribution data presented in Weitkamp and Schadt (1982) indicate that fish less than 70 mm long are present in small numbers through the end of May. This distribution suggests that small, naturally spawned fish arrive in the estuary through the month of May.

The bulk of the migration of larger juveniles to the estuary occurs during May and early June and the peak is narrow (Weitkamp and Campbell 1980; Meyer et al. 1981; Warner and Fritz 1995). Most of these fish are longer than 70 mm and hatchery-reared fish are dominant. Meyer et al. (1981) reported that chinook salmon abundance peaked twice, once in May and again in early June, coinciding with releases from upstream hatcheries. Juvenile chinook were present in the estuary from April 8, the date of first sampling, to July 31, the last day of sampling. Releases from upstream hatcheries may continue well past June; for example, during 1998, there were releases of juvenile chinook as late as July 22 (Hotchkiss 2000).

Chinook numbers peak in the upper Duwamish estuary slightly earlier than in the lower parts of the estuary. This suggests a period of residence within the estuary. Based on a mark-recapture study, Weitkamp and Schadt (1982) concluded that residence time in the Duwamish estuary was about two weeks. Salo (1969) found that some juvenile chinook are present in the Duwamish estuary for at least two months.

Existing reports commissioned by the Port of Seattle, along with current sampling of juvenile salmonids, reveal that juvenile chinook salmon are present in Elliott Bay as late as August or September and appear to be rearing in the nearshore environment (Taylor et al. 1999; Hotchkiss 2000). The fish captured during these months were not smolts, but were larger fish (approximately 120 to 150 mm). It is unclear whether these fish are a listed stock; they may be Green/Duwamish River stock, migrants from other Puget Sound river systems, or late releases from upstream hatcheries. These larger juveniles were most likely captured nearshore while they were only temporarily using that habitat. Chinook over approximately 70 to 80 mm in length are able to function offshore, and apparently only use nearshore habitat opportunistically (Healey 1982, 1991).

According to Warner and Fritz (1995), yearling chinook do not occur in the Green/Duwamish River other than as hatchery-produced fish. Hatchery yearlings that will eventually pass through the Duwamish River are released at Icy Creek (approximately 40 miles upstream from the action area). Their large size (140 to 175 mm) indicates that these fish are not dependent on the estuary for feeding or completion of their physiological transition to seawater. Yearlings are captured in the estuary in mid-May, but generally exit the estuary within two weeks of arrival (Warner and Fritz 1995).

4.1.3.3 *Juvenile Habitat Use and Feeding*

Meyer et al. (1981) found that larger fish were typically found further offshore than smaller fish, and that chinook in the Duwamish estuary were present in water column habitat, but were found predominantly along intertidal and shallow subtidal shorelines. The larger fish appeared to move inshore only at night. Epibenthic crustaceans were found to be the primary salmonid prey at night, whereas pelagic crustaceans (calanoid copepods), insects, and to some extent, juvenile fish were more important prey during the day.

Juvenile chinook have the capacity to occupy a wide range of habitat types and feed on a wide spectrum of prey while in the estuary. The diet of chinook in the estuary can be dominated by pelagic planktonic organisms (calanoids), but insects (chironomids) and some epibenthic copepods are also taken (Weitkamp and Schadt 1982). Weitkamp and Schadt (1982) examined the greatest number of chinook sampled in the Duwamish Waterway and included fish captured next to shore with a beach seine and in the middle of the waterway with a purse seine. The diets of the two groups were found to be similar, dominated by calanoid copepods. Few epibenthic prey were found in stomachs, nor were insects common. Meyer et al. (1981) found more differentiation in diet between chinook captured near shore by beach seine and those captured off shore by purse seine. In that study, epibenthic prey dominated in the fish caught by beach seine and copepod species dominated in the fish caught by purse seine. Diet can vary depending upon the specific habitat occupied within the waterway. For example, fingerlings captured within the Terminal 108 mitigation site, an area with low-gradient shoreline habitat, were feeding on epibenthic prey and insects (chironomids) (Jones & Stokes Associates 1990). Similar results were reported for Kellogg Island (Parametrix 1990).

4.1.4 Direct and Indirect Effects

Potential direct and indirect effects to Puget Sound chinook salmon from this project include reduced DO, temporary impacts to water quality, and disturbance of existing subtidal habitat. These effects are discussed below.

4.1.4.1 Dissolved Oxygen

Based on a review of six studies on the effects of dredging on dissolved oxygen (DO) levels, LaSalle (1988) concluded that when DO depletion is observed near dredging activities, it usually occurs in the lower water column. A number of other studies reviewed by LaSalle (1988) showed little or no measurable reduction in DO around dredging operations. Simenstad (1988) concluded that because high sediment biological oxygen demand is not common, significant depletion of DO is usually not a factor. A model created by LaSalle (1988) demonstrated that even in a situation where the upper limit of expected suspended sediment is reached during dredging operations, DO depletion of no more than 0.1 mg/l would occur at depth. LaSalle (1998) concluded that based on the relatively low levels of suspended material generated by dredging operations and considering factors such as flushing, DO depletion around dredging activities should be minimal.

Research conducted at a sediment disposal site in Elliott Bay showed only small, short-term decreases in DO during and after sediment disposal (PSDDA 1988). At no point in the study did DO levels fall below the threshold of 5 mg/l established by regulatory agencies to be harmful to salmonids. Based on the results of these studies and the most current sediment quality reports for the area, DO is not expected to drop to a concentration shown to adversely affect salmonids.

4.1.4.2 *Temporary Turbidity*

Suspension of sediments occurs throughout the water column from clamshell dredging activities. Sediments can also fall or be washed from barges. The potential effects of increased turbidity on salmonids have been investigated in a number of dredging studies (Servizi and Martens 1987 and 1992, Emmet et al. 1988, Noggle 1978, Simenstad 1988, Redding et al. 1987, Mortensen et al. 1976, Berg and Northcote 1985). There are several mechanisms by which suspended sediment can affect juvenile salmonids including direct mortality, gill tissue damage, physiological stress, and behavioral changes. Each is discussed below.

Direct Mortality

Direct mortality from extremely high levels of suspended sediment has been demonstrated at concentrations far exceeding those caused by typical dredging operations. Laboratory studies have consistently found that the 96-hour median lethal concentration (LC50) for juvenile salmonids occurs at levels above 6,000 mg/L (Stober et al. 1981, Salo et al. 1980, LeGore and DesVoigne 1973). However, typical samples collected adjacent to dredge sites (within approximately 150 feet) contain suspended sediment concentrations between 50 and 150 mg/L (Havis 1988, Salo et al. 1979, Palermo et al. 1990). Based on an evaluation of seven clamshell dredge operations, LaSalle (1988) determined that suspended sediment levels of 700 mg/L and 1,100 mg/L at the surface and bottom, respectively, would represent the upper limit concentration expected adjacent to the dredge source (within approximately 300 feet). Concentrations of this magnitude could occur at sites with fine silt or clay substrates. Much lower concentrations (50 to 150 mg/L at 150 feet) are expected at sites with coarser sediment. Because direct mortality occurs at turbidity levels that far exceed typical dredging operations, direct mortality from suspended sediment is not expected to occur during this project.

Gill Tissue Damage

Studies also indicate that suspended sediment concentrations occurring near dredging activity will not cause gill damage in salmonids. Servizi and Martens (1992) found that gill damage was absent in underyearling coho salmon exposed to concentrations of suspended sediments lower than 3,143 mg/L. Redding et al. (1987) also found that the appearance of gill tissue was similar for control fish and those exposed to high, medium, and low concentrations of suspended topsoil, ash, and clay. Based on the results of these studies, juvenile and subadult salmonids, if any are present, are not expected to experience gill tissue damage even if exposed to the upper limit of suspended sediment concentrations expected during dredging. Further, given the ability of adult salmonids to avoid areas with less than favorable conditions, adult salmonids are not expected to experience gill tissue damage as a result of this project.

Physiological Stress

Suspended sediments have been shown to cause stress in salmonids, but at concentrations higher than those typically caused by dredging. Underyearling coho salmon exposed to suspended sediment concentrations above 2,000 mg/L were physiologically stressed as indicated by elevated blood plasma cortisol levels (Redding et al. 1987). Exposure to approximately 500 mg/L of suspended sediment for two to eight consecutive days also caused stress, but to a much lesser degree (Redding et al. 1987, Servizi and Martens 1987). At 150 to 200 mg/L of glacial till, no significant difference in blood plasma glucose concentrations were observed. These results indicate that upper limit suspended sediment conditions near dredging activity (700 to 1,100 mg/L) can cause stress in juveniles if exposure continues for an extended period of time. Continued exposure is unlikely, however, due to the tendency for unconfined salmonids to avoid areas with elevated suspended sediment concentrations (Salo et al. 1980). Typical sediment plumes caused by dredging do not create suspended sediment concentrations high enough to cause stress in juvenile salmonids.

Behavioral Effects

Behavioral responses to elevated levels of suspended sediment include feeding disruption and changes in migratory behavior (Servizi 1988, Martin et al. 1977). Several studies indicate that salmonid foraging behavior is impaired by high levels of suspended sediment (Bisson and Bilby 1982, Berg and Northcote 1985). Redding et al. (1987) demonstrated that yearling coho and steelhead exposed to high levels (2,000 to 3,000 mg/L) of suspended sediment did not rise to the surface to feed. Yearling coho and steelhead exposed to lower levels (400 to 600 mg/L), however, actively fed at the surface throughout the experiment. In these instances, the thresholds at which feeding effectiveness was impaired greatly exceeded the upper limit of expected suspended solids during dredging.

Adult migration may also be subject to disruption from suspended sediment. Adult salmonids are not necessarily closely associated with the shoreline and are less vulnerable to adverse impacts if they encounter turbid conditions. Whitman et al. (1982) used volcanic ash from the eruption of Mt. St. Helens to recreate highly turbid conditions faced by returning adult salmon. This study showed that, despite very high levels of ash, adult male chinook were still able to detect natal waters through olfaction even when subjected to seven days of total suspended sediment levels of 650 mg/L. Migratory or feeding disruptions are not likely to occur from dredging activities.

4.1.4.3 Subtidal Habitat Disturbance

The proposed dredging occurs exclusively within subtidal habitat and will not disturb intertidal or shallow subtidal habitat. Dredging may cause a short-term change in the characteristics of the subtidal benthic community. The material to be dredged is fairly recently deposited, and it is not ideal substrate for colonization by benthic organisms because it is coarse and lacking in organic matter. However, colonization may have occurred, in which case dredging would result in the loss of benthic organisms, temporarily reducing benthic abundance. In an industrial area, benthic species are likely to be opportunistic and able to recolonize the dredge site relatively quickly. However, the benthic infauna community does not directly support chinook salmon, nor is it directly linked to prey fish (e.g., herring and sand lance), which feed on pelagic species (Hart 1973). In addition, the area to be dredged experiences disturbance as a baseline condition and likely does not support a strong benthic community. Because chinook and bull trout do not typically use infauna prey, and because the benthic community would rapidly recover, disturbance of subtidal habitat is not likely to adversely affect these species.

The short-term increases in turbidity and decreases in DO that may occur as a result of the project are not expected to affect the abundance of pelagic prey items. Concentrations of sediments suspended during dredging are expected to be greatest near the bottom of the water column, where pelagic zooplankton densities are the lowest.

4.1.5 Effects Determination

The activities described in this BE will not result in long-term, permanent adverse impacts to Puget Sound chinook salmon populations. The short-term, temporary nature of impacts due to dredging are insignificant and/or discountable. No intertidal or shallow subtidal substrate disturbance will occur. Conservation measures such as conducting work when Puget Sound chinook salmon are less likely to be present, as well as measures to regulate dredging to reduce turbidity and control dredge limits will be employed to reduce effects on salmonids. Therefore, it is concluded that this project **may affect, but is not likely to adversely affect** Puget Sound chinook salmon.

4.1.6 Critical Habitat Effects Determination

The project area is in Critical Habitat Unit 11, the Duwamish Subbasin. The lower Duwamish River is heavily industrialized, with modified shorelines, and does not offer suitable spawning or rearing habitat. It does offer an estuarine transition zone and a migratory corridor for chinook salmon.

The project area is regularly dredged and there is consistent barge traffic and industrial activity. The substrate that will be disturbed by dredging is 100 percent spilled material. One foot of the material will be left in place to prevent resuspension of contaminants. The proposed project will not reduce foraging opportunities or prey resources, nor will it affect the action area's use as a migratory corridor. Therefore, it is determined that the project **will not adversely modify proposed critical habitat, and if listed, may affect, but is not likely to adversely affect** critical habitat for Puget Sound chinook salmon.

4.2 Coastal-Puget Sound Bull Trout (*Salvelinus confluentus*)

4.2.1 Status

Bull trout are listed as threatened.

4.2.2 Critical Habitat

On June 25, 2004, USFWS published proposed rules for designating critical habitat for the Coastal-Puget Sound population of bull trout, which was listed as a threatened species in 1999. Critical habitat designates areas that contain PCEs essential for the conservation of a threatened or endangered species and which may require special management considerations.

For an area to be included as critical habitat it has to provide one or more of the following functions for bull trout:

1. spawning, rearing, foraging, or over-wintering habitat to support essential existing local populations
2. movement corridors necessary for maintaining essential migratory life history forms.
3. suitable habitat that is considered essential for recovering existing local populations that have declined or that need to be re-established to achieve recovery.

Areas providing one or more of these functions and at least one of the following nine primary constituent elements are designated as critical habitat:

1. Water temperatures ranging from 36 to 59 °F (2 to 15 °C), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life history stage and form, geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local groundwater influence.
2. Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures.
3. Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine substrate less than 0.25 in (0.63 cm) in diameter and minimal substrate embeddedness are characteristic of these conditions.

4. A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, a hydrograph that demonstrates the ability to support bull trout populations by minimizing daily and day-to-day fluctuations and minimizing departures from the natural cycle of flow levels corresponding with seasonal variation.
5. Springs, seeps, groundwater sources, and subsurface water connectivity to contribute to water quality and quantity.
6. Migratory corridors with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows.
7. An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.
8. Few or no nonnative predatory, interbreeding, or competitive species present.
9. Permanent water of sufficient quantity and quality such that normal reproduction, growth and survival are not inhibited.

The critical habitat proposal calls for a total of 2,290 miles of streams in western Washington to be designated as bull trout critical habitat, along with 52,540 acres of lakes and reservoirs and marine habitat paralleling 985 miles of shoreline. All areas proposed as critical habitat for bull trout are within the historic geographic range of the species and already contain features and habitat characteristics that are necessary to sustain the species. However, not all areas that are currently occupied are designated as critical habitat because the USFWS determined that some small scattered areas with bull trout are not essential to the conservation of the species based on current scientific and commercial information. In marine nearshore areas, the inshore extent of critical habitat is the mean higher high water (MHHW) line, including tidally influenced freshwater heads of estuaries. Adjacent shoreline riparian areas, bluffs, and uplands are not proposed as critical habitat. The proposed offshore extent of critical habitat for marine nearshore areas is to the depth of 33 feet (10 meters) relative to MLLW (average of all the lower low water heights of the two daily tidal levels) which is the average depth of the photic zone.

The project area is in Critical Habitat Unit 28, Puget Sound, and the Lower Green Critical Habitat Subunit. The area functions as a movement corridor, and furnishes the PCE requirements of a migratory corridor described in number six above.

4.2.3 Biology and Distribution

Bull trout are members of the char subgroup of the salmon family. The anadromous type inhabits upper tributary streams and lake and reservoir systems and migrates to sea annually. Bull trout feed on terrestrial and aquatic insects, and as they grow in size, their diets include whitefish, sculpins, and other trout. Bull trout spawn between the ages of 4 and 7 when they reach maturity. They spawn in the fall, when temperatures begin to drop, in cold, clear streams. Bull trout can spawn repeatedly, and can live many years. Adults and juveniles return to the marine environment, generally between May and early July, during which time they grow up to 25 mm per month.

Bull trout are in the char group of the salmonidae family. They closely resemble Dolly Varden char (*Salvelinus malma*), and were considered an inland form of Dolly Varden until 1978 when they were given a separate species name. Due to the close resemblance of Dolly Varden to bull trout, on January 9, 2001, the USFWS proposed the protection of Coastal-Puget Sound Dolly Varden under the "similarity of appearance" provision of the ESA.

The distribution of bull trout in freshwater is strongly influenced by water temperature (Ratliff 1992; Rieman and McIntyre 1993, Bonneau and Scarnechia 1996; Buchanan and Gregory 1997; Lee et al. 1997), and they are associated with the coldest stream reaches in watershed basins (Lee et al. 1997). Populations in the Pacific Northwest are found primarily in upper tributary streams or lake and reservoir systems.

Washington Department of Fish and Wildlife (WDFW) does not monitor bull trout in the Green/Duwamish system because, according to its records, bull trout do not spawn in this system. The information suggesting that bull trout populations exist in the middle and lower Green (Duwamish) River is limited to the capture of adult specimens in the lower river and nearshore estuarine environment (R2 Resource Consultants 2001).

Rearing by juvenile bull trout may occur in the action area; however, no juvenile bull trout have been identified in sampling studies conducted in the vicinity of the action area (Salo 1969; Weitkamp and Campbell 1980; Meyer *et al.* 1981; Weitkamp and Schadt 1982; Parametrix 1990; Warner and Fritz 1995; Cordell *et al.* 1997; Cordell *et al.* 1998; Pacific International Engineering and Pentec Environmental 1999; Taylor *et al.* 1999; R2 Resource Consultants 2000). Some adult char have been captured in the upper turning basin during recent juvenile salmonid sampling studies conducted by the Port of Seattle (Hotchkiss 2000); analyses are underway to determine if these fish were bull trout or Dolly Varden. Additionally, a 1995 survey of fish populations in the lower Duwamish River conducted for the Muckleshoot Tribe identified a single adult bull trout in the reach between Highway 99 and Kellogg Island (Warner and Fritz 1995).

Anadromous juveniles migrate from headwater and mainstem rearing habitats during the spring (April through early June) to use estuarine and nearshore marine habitat. Anadromous bull trout migrate to salt water at a much larger size than other anadromous fish. Due to their larger size, they are less confined to nearshore habitats and better suited to avoid nearshore disturbances than other anadromous salmonids. These fish experience rapid growth in salt water ranging from 25 to 40 mm per month. Their distribution in salt water is similar to the distribution of forage fish, their predominant prey. Prey species include surf smelt (*Hypomesus pretiosus*), Pacific herring (*Clupea harengus pallasi*), Pacific sand lance (*Ammodytes hexapterus*), pink salmon (*Oncorhynchus gorbuscha*) smolts, chum salmon (*Oncorhynchus keta*) smolts, and a number of invertebrates.

Sub-adults migrate from estuarine and marine habitats to the lower portions of rivers and tributaries during the late summer and early fall. Sub-adults measure from 150 to 470 mm during this first migration back to freshwater habitat. These fish reside in freshwater habitats through the winter and return to estuarine and marine habitats the following spring. Migration in marine habitats can range from 30 to 40 km from the river mouth in the spring. The second rearing season in salt water is abbreviated, during which the fish mature prior to beginning a spawning migration from late May through early July. First-time anadromous spawners measure from 400 to 525 mm in length. These spawners can migrate up to 200 km.

During the 1970s, several adult bull trout/Dolly Varden were captured above the Duwamish Waterway upper turning basin; because they were captured before the two char were considered separate species, it is not known whether they were bull trout or Dolly Varden. The timing of presence of these fish appeared to be related to the presence of high numbers of juvenile salmonids, on which bull trout/Dolly Varden prey. Char that are occasionally found in the Duwamish River are believed to enter the river from other systems, spending time in the lower Duwamish but not migrating upriver to spawn.

As noted earlier, juvenile salmonid sampling conducted by the Port of Seattle in the Duwamish River turning basin in August and September 2000 identified several adult char (Hotchkiss 2000). A total of eight char were identified, with two of the fish caught in August and six caught in September. The Port has not determined whether the fish are bull trout or Dolly Varden.

Bull trout could be sparsely distributed in the Duwamish River during certain times of the year, and could be present in the action area.

4.2.4 Direct and Indirect Effects

See discussion of Direct and Indirect Effects on Puget Sound chinook in Section 4.1.4.

4.2.5 Effects Determination

The activities described in this BE will not result in long-term, permanent adverse impacts to bull trout. The short-term, temporary nature of impacts due to dredging are insignificant and/or discountable. No intertidal or shallow subtidal substrate disturbance will occur. Conservation measures such as conducting work when bull trout are less likely to be present, as well as measures to regulate dredging to reduce turbidity and control dredge limits, will be employed to reduce effects on bull trout. Therefore, it is concluded that this project **may affect, but is not likely to adversely affect** bull trout.

4.2.6 Critical Habitat Effects Determination

The Lower Green Critical Habitat Subunit (CHSU), of which the project area is a part, provides foraging, migration, and overwintering habitat PCEs for bull trout. The lower

Duwamish Waterway is heavily industrialized and there is a lack of a known spawning population in the Green/Duwamish River watershed. Goetz et al. (2004) compiled recent studies that have documented the occurrence of subadult and adult bull trout in the lower Duwamish Waterway, including some visual indications of successful feeding.

The project area is subject to consistent barge traffic and industrial activity. The substrate that will be disturbed by dredging is 100 percent spilled material. One foot of the material will be left in place to prevent resuspension of contaminants. The proposed project will not adversely modify foraging opportunities, prey resources, or affect the use of the area as a migration corridor. Therefore, it is determined that the project **will not adversely modify proposed critical habitat, and if listed, may affect, but is not likely to adversely affect** critical habitat for Coastal-Puget Sound bull trout.

4.3 Leatherback Sea Turtle (*Dermochelys coriacea*)

4.3.1 Status

The leatherback sea turtle is listed as endangered.

4.3.2 Critical Habitat

No areas in Washington have been designated as critical habitat for leatherback sea turtles.

4.3.3 Biology and Distribution in the Project Area

In the Pacific Ocean, leatherback sea turtles are found along the U.S. coast, with most nesting areas in tropical waters near the Solomon Islands, Irian Jaya, Papua New Guinea, Mexico, Costa Rica, and Malaysia (NMFS 1999). In 1989 and 1990, 16 leatherback sea turtles were observed off the coast of Washington and Oregon, with three more observed in 1992 (Bowlby et al. 1994). Most of the turtle sightings were in offshore waters, averaging approximately 33 nautical miles from shore.

It is highly unlikely that leatherback sea turtles would be present in the project area since they are not known to use bays and estuaries in Washington State for any portion of their life cycle.

4.3.4 Direct and Indirect Effects

Due to the absence of leatherback sea turtles and suitable habitat for sea turtles in the project areas, no direct effects on leatherback sea turtles are identified.

4.3.5 Effects Determination

Due to the fact that leatherback sea turtles are not known to occur in Puget Sound or its tributary estuaries, it is determined that this project will have **no effect on leatherback sea turtles.**

4.3.6 Critical Habitat Effects Determination

Not applicable.

4.4 Steller Sea Lion (*Eumetopias jubatus*)

4.4.1 Status

Steller sea lions are listed as threatened.

4.4.2 Critical Habitat

No critical habitat has been designated in Washington. Critical habitat is associated with breeding and haulout areas in Alaska, California, and Oregon.

4.4.3 Biology and Distribution in the Project Area

Steller sea lions feed in open-water habitat from nearshore areas to the edge of the continental shelf (WDW 1993). Diet studies conducted over the past 15 years show that Steller sea lions eat a variety of fishes and invertebrates; demersal and off-bottom schooling fishes predominate (Jones 1981, Pitcher 1981), while harbor seals and other pinnipeds are occasionally eaten (Pitcher and Fay 1982). Principal prey identified in stomachs and scats collected in British Columbia included hake, herring, octopus, Pacific cod, rockfish, and salmon (Olesiuk et al. 1990). Rockfish and hake are consistently important components of the Steller sea lions' diet (WDW 1993).

Adult Steller sea lions congregate at rookeries on the outer coast for pupping and breeding from late May to early June (Gisiner 1985). Rookeries are usually located on beaches of relatively remote islands, often in areas exposed to wind and waves, where access by humans and other mammalian predators is difficult (WDW 1993).

Steller sea lions occur year-round in Washington waters, but do not breed in Washington (NMFS 1992). Their numbers in Washington decline during summer months, which correspond to the breeding season at Oregon and British Columbia rookeries. Steller sea lions have not been observed entering estuaries in the Puget Sound (NMFS 2004).

4.4.4 Direct and Indirect Effects

There are no identified direct effects on Steller sea lions. It is highly unlikely that Steller sea lions will be present in the Duwamish River estuary during construction. If an individual Steller sea lion entered the project area during construction, it could be temporarily displaced. However, the project area is subject to consistent vessel traffic and industrial activity, and use of the area by Steller sea lions is not expected.

4.4.5 Effects Determination

Because of the extremely low likelihood that Steller sea lions will be present in the project area, it is determined that the project will have **no effect** on Steller sea lions.

4.4.6 Critical Habitat Effects Determination

Not applicable.

4.5 Humpback Whale (*Megaptera novaeangliae*)

4.5.1 Status

The humpback whale is listed as endangered.

4.5.2 Critical Habitat

No critical habitat has been designated for humpback whales.

4.5.3 Biology and Distribution in the Project Area

Major humpback whale breeding and calving areas are in Mexican and Hawaiian waters. Humpback whales migrate to Alaska during the summer to feed. The Washington coast is a corridor for their annual migration north to feeding grounds and south to breeding grounds. Feeding groups of up to five whales have been documented on Juan de Fuca Bank and La Perouse Bank in summer (Osborne et al. 1998).

Humpback whales forage either at or below the water surface. Humpback whales feed on benthic and pelagic organisms including euphausiids, copepods, and other crustacean zooplankton, small schooling fish such as sand lance and herring, as well as salmonids, pollock, capelin, and some cephalopod mollusks (Perry et al. 1999). Simenstad et al. (1979) listed four species of euphausiids and four species of small schooling fish found in stomachs of humpback whales taken in the eastern North Pacific Ocean.

4.5.4 Direct and Indirect Effects

Humpback whales are generally observed 20 km or more offshore and are not known to occur in the central Puget Sound. Therefore, there are no identified direct effects on humpback whales or their prey.

4.5.5 Effects Determination

Humpback whales do not typically use the Puget Sound to breed or feed, and it is highly unlikely that they would enter the highly urbanized estuarine environment of the project area. Because of its geographic isolation from migration routes and feeding areas, and vessel and industrial activity in the project area, it is highly unlikely that humpback whales will be present in or near the Duwamish River estuary or Elliott Bay during construction. Therefore, it is concluded that this project will have **no effect on humpback whales**.

4.5.6 Critical Habitat Effects Determination

Not applicable.

4.6 Killer whale (*Orcinus orca*)

4.6.1 Status

On December 16, 2004, the NMFS proposed to list the Southern Resident distinct population segment (DPS) of killer whales (*Orcinus orca;* also known as orca whales) as threatened under the ESA (Federal Register 69, No. 245, 76680).

4.6.2 Critical Habitat

According to the proposal for listing, the NMFS is currently compiling information to prepare a critical habitat proposal for the Southern Resident DPS, but critical habitat has not yet been proposed or designated.

4.6.3 Biology and Distribution in the Project Area

Killer whales in the Eastern North Pacific region are categorized as resident, transient, or offshore whales. Residents in the North Pacific are further classified into Northern, Southern, Southern Alaska, and Western North Pacific groups. The Southern Resident killer whale group has been established as a DPS and a stock under the Marine Mammal Protection Act of 1972; this group contains the pods, or groups, of J pod, K pod, and L pod.

The geographic distribution of Southern Resident killer whales is year-round in the coastal waters off Oregon, Washington, Vancouver Island, and off the coast of central California and the Queen Charlotte Islands (Center for Biodiversity 2001). In the summer, Southern Residents are typically found in the Georgia Strait, Strait of Juan de Fuca, and the outer coastal waters of the continental shelf. In the fall, the J pod migrates into Puget Sound, while the rest of the population makes extended trips through the Strait of Juan de Fuca. In the winter, the K and L pods retreat from inland waters, and are seldom detected in the core areas until late spring. The J pod generally remains in inland waterways throughout the winter, with most of their activity in the Puget Sound. Other winter movements and range of Southern Residents are not well understood.

Killer whales use the entire water column, including regular access to the ocean surface to breathe and rest (Bateson, 1974; Herman, 1991). They remain underwater 95 percent of the time, with 60 to 70 percent of their time spent between the surface and a depth of

20 meters, while diving regularly to depths of over 200 meters (Baird 1994; Baird et al., 1998). Southern Residents spend less than 5 percent of their time between depths of 60 and 250 meters (Center for Biodiversity 2001). Time-depth recorder tagging studies of Southern Residents have documented that whales regularly dive deeper than 150 meters, but that there is a trend toward a greater frequency of shallower dives in recent years (Baird and Hanson 2004).

Residents tend to feed primarily on fish, whereas transients prey on other marine mammals (Morton 1990). Southern Residents primarily feed upon salmon species (Balcomb et al., 1980; Bigg et al., 1987). Chinook salmon dominate their diet (38 percent) followed by pink salmon (10 percent) and other salmon species or unidentifiable salmon species (Ford et al. 1998). Bottom fish may increasingly contribute to the diet as salmon populations decline (Center for Biological Diversity 2001).

4.6.4 Direct and Indirect Effects

Killer whales have not been sighted recently in Elliott Bay (Orca Network 2005), but they could occur in the marine waters of Puget Sound. Effects to killer whales from project would be indirect through effects on their prey availability. This BE evaluates effects on chinook salmon, the principal component of the southern resident's diet. This project may affect, but is not likely to adversely affect Puget Sound chinook salmon, and therefore, adverse effects to killer whales are not expected.

4.6.5 Effects Determination

Killer whales are not known to occur in the action area. A reduction in prey availability is not anticipated as a result of this project. Furthermore, the Green/Duwamish river system is one of many local sources of chinook salmon. It is determined that this project will not jeopardize the continued existence of killer whales, and if listed, will have no effect on killer whales.

4.6.6 Critical Habitat Effects Determination

Not applicable.

4.7 Marbled Murrelet (*Brachyramphus marmoratus*)

4.7.1 Status

The marbled murrelet is listed as threatened.

4.7.2 Critical Habitat

The USFWS designated critical habitat for the marbled murrelet in 1996. Designated critical habitat includes old growth stands and other suitable nesting areas. No critical habitat has been designated near the project area (61 Fed. Reg. 26258).

4.7.3 Biology and Distribution in the Project Area

The marbled murrelet is a small seabird that occurs in North America from Alaska to central California. These birds feed on small fish and invertebrates in nearshore marine waters, typically 650 feet to 0.25 mile from shore (Sustainable Ecosystems Institute 1997). They nest in mature and old-growth coastal forests. Marbled murrelet nest sites are characterized by stands of mature trees with a multi-layered canopy, openings in canopy to allow access and branches suitable for nesting. Nests are on wide, mossy branches, high up in conifers.

No marbled murrelet nests are recorded in the project vicinity, and suitable forest stands do not occur within several miles of the lower Duwamish industrial area. During surveys from 1992 to 2004 by the Puget Sound Ambient Monitoring Program (PSAMP) and WDFW, birds were rarely observed anywhere along the Elliott Bay shoreline. The nearest marbled murrelet sighting in winter was on Restoration Point on Bainbridge Island, about 7 miles west of the project site. The nearest summer sighting was at West Point in Discovery Park, a little over 7 miles north of the project site.

4.7.4 Direct and Indirect Effects

Marbled murrelets are not known to forage in the waters near the mouth of the Duwamish River. There are no identified direct or indirect effects on marbled murrelets as a result of this project. The project will not impact critical habitat, nesting areas, foraging area, or prey species.

4.7.5 Effects Determination

Marbled murrelets are not expected to be in the project area during construction. Even if a bird enters the project area, noise levels from construction will not be higher than normal background levels in this industrial area. Therefore, it is concluded that this project will have **no effect** on marbled murrelets.

4.7.6 Critical Habitat Effects Determination

No critical habitat is designated near the project area.

4.8 Bald Eagle (*Haliaeetus leucocephalus*)

4.8.1 Status

The bald eagle is listed as threatened.

4.8.2 Critical Habitat

No critical habitat has been designated for bald eagles.

4.8.3 Biology and Distribution in the Project Area

In Washington, resident bald eagle populations occur primarily near large bodies of water west of the Cascade Mountains. Bald eagles occur in the Puget Sound area, including Elliott Bay. The closest recorded nest or breeding occurrence is 0.5 mile from the project area.

Bald eagles in the vicinity of the action area appear to be habituated to human activity, and have been frequently observed perching on barges anchored in Elliott Bay (Parametrix 1996). Young have been successfully hatched and fledged in industrial areas near the Duwamish River. According to a WDFW Priority Habitat and Species maps for bald eagle, the nearest nest site occurs approximately 0.5 mile to the southeast of the project area, on the forested hillside above Pigeon Point. Foraging could occur in the action area during any season when eagles are present at the nest sites.

4.8.3.1 Nesting

Nesting occurs from January 1 to August 15 (USFWS 1986). Abundant food is critical during nesting because young bald eagles are less tolerant to food deprivation than adults. Bald eagle nests are frequently associated with water, such as the Puget Sound, and most often occur close to shorelines.

The Pacific States Bald Eagle Recovery Plan recommends limiting construction activities near bald eagle nests during critical wintering and nesting periods. The plan recommends construction and disturbance setbacks of 400 meters (1,313 feet) if the nest does not have a line of sight to the proposed construction activity, or 800 meters (2,625 feet) if the nest is within line of sight of construction. The closest bald eagle's nest to the project area is approximately 0.5 mile (approximately 2,700 feet) away. It is not known whether a line of sight exists between the nest and the project area, but the project is not subject to USFWS recommended timing restrictions for activity within line of sight, and therefore is not subject to timing restrictions to protect bald eagles.

4.8.3.2 Foraging

Foraging habitat for bald eagles is typically associated with water features such as rivers, lakes, and coastal shorelines where fish, waterfowl, and seabirds are preyed upon. Bald eagle foraging is opportunistic and they feed on dead or weakened prey. Their diets include fish such as salmon, catfish, pollock, cod, rockfish, carp, dogfish, sculpin, and hake. They also feed on marine birds and their offspring and small terrestrial mammals. They prefer high structures for perching such as trees along the shoreline, but will also use other structures such as cliffs, pilings, and open ground. They are usually seen foraging in open areas with wide views (Stalmaster and Newman 1979).

4.8.3.3 Perch Sites

Perch sites may be used for activities that include hunting, prey consumption, signaling territory occupation, and resting. Perches are most often associated with food sources near water and will have visual access to adjacent habitats (Stalmaster and Newman 1979). Bald eagles will often choose the highest tree on the edge of a stand, selecting the strongest lateral branches. There are no perch trees in the vicinity of the project or action area.

4.8.3.4 *Wintering*

Wintering activities for bald eagles occur from October 31 through March 31. During the winter months, bald eagles forage, construct nests, and engage in courtship activities. There may also be bald eagles from outside the region that forage along the coastline of Puget Sound in the winter. Winter is a high-stress period for bald eagles because food is scarce and adverse weather requires the birds to expend more energy to survive.

4.8.4 Direct and Indirect Effects

Direct and indirect effects to bald eagles include noise disturbance. Noise levels during maintenance dredging are not expected to exceed normal ambient noise levels in the action area from barge off-loading operations.

4.8.4.1 *Nesting*

The nearest eagle nest is approximately 0.5 mile from the site. Between the site and the nest, there is shipping traffic on the Duwamish Waterway, other industrial activity on the western bank of the Duwamish, an active railroad line, and a busy industrial arterial road. Dredging at the Ash Grove Cement site will not be louder or more visually invasive than normal barge off-loading activities. Eagles that would nest in this area are habituated to human activity. No direct or indirect effects on nesting are expected.

4.8.4.2 *Foraging*

Dredging, barge loading, and other industrial activities occur daily in the action area. Dredging at the site will not increase noise or disturbance levels above ambient conditions, and therefore direct or indirect adverse effects to foraging bald eagles are not expected.

4.8.4.3 Wintering

There are no documented wintering areas or communal roost sites near the Ash Grove Cement facility. The effects of the proposed dredging activity on wintering bald eagles are expected to be similar to those identified under nesting and foraging above. Noise from dredging is not expected to exceed ambient levels, and therefore, direct or indirect adverse effects on wintering bald eagles are not expected.

4.8.4.4 Perching

No direct or indirect effects on perching are expected.

4.8.5 Effects Determination

Based on the fact that the closest bald eagle is over 0.5 mile from the project area and there are no identified direct or indirect effects on bald eagles from the proposed project, it is concluded that this project **may affect, but is not likely to adversely affect,** bald eagles.

4.8.6 Critical Habitat Effects Determination

No critical habitat has been designated for bald eagles.

4.9 Interrelated/Interdependent Effects

There are no identified interrelated or interdependent effects from proposed dredging at the Ash Grove Cement facility. The project will not result in additional actions that have no independent utility apart from the proposed project. The project will not result in increased maintenance or increased access to the area.

The proposed project is a single cycle of biannual maintenance dredging plan through 2013. It does not depend on subsequent maintenance dredging for its justification. There are no other anticipated related actions that could impact threatened or endangered species in the project area.

4.10 Cumulative Effects

All future actions that are federally funded and/or would result in the construction of any structure, excavation or deposition of material in waters of the U.S., or modification of the course, location, condition, or capacity of navigable waters of the U.S., would require a federal permit and are subject to ESA review. Therefore, no actions requiring federal funding or permits are considered in the cumulative effects review process.

Additional maintenance dredging is planned as described in Section 2.3.1, and each maintenance dredging cycle will be evaluated separately in accordance with the Corps Permit No. 2001-1-00155.

4.11 Incidental Take Analysis

The potential for incidental take of ESA-listed species is minimal because of the absence of ESA-listed species in the project area at the time of dredging, and the use of the specified conservation measures during construction activities. The activities have a very low likelihood of annoying any listed species to an extent that would significantly disrupt normal behavior patterns. There will be no adverse critical habitat modification. Therefore, incidental take of any threatened or endangered species is not expected.

5 REFERENCES

Anchor Environmental, L.L.C. 2004. Biological Evaluation, Maintenance Dredging Project, Glacier Northwest Seattle Cement Terminal. September 2004.

Baird, R.W. 1994. Foraging behaviour and ecology of transient killer whales. Ph.D. thesis, Simon Fraser University, Burnaby, B.C.

Baird, R.W., L.M. Dill, and M.B. Hanson. 1998. Diving Behavior of Killer Whales. Abstract of a paper presented at the World Marine Mammal Conference, Monaco, January, 1998.

Baird, R. W., and M. B. Hanson. 2004. A progress report on diving behavior of Southern Resident killerwhales. Contract report under Order No. AB133F-03-SE-1070. (Available from M. B. Hanson, NWFSC, 2725 Montlake Blvd. East, Seattle, WA 98112.)

Balcomb, K.C., J.R. Boran, R.W. Osborne, and N.J. Haenel, 1980. Observations of KillerWhales (*Orcinus orca*) in Greater Puget Sound, State of Washington, NTISPB80-224728, U.S. Dept. of Commerce, Springfield, VA.

Bateson, G. 1974. Observations of a Cetacean Community. In: J. McIntyre (Ed.), Mind in the Waters, New York, Charles Scribner's Sons, Sierra Club Books, 146-165.

Berg, L. and T.G. Northcote. 1985. Changes in territorial, gill flaring and feeding behavior in juvenile coho salmon (*Oncorhynchus kisutch*) following short-term pulses of suspended sediment. Can. J. Fish. Aquat. Sci. 42:1410-1417.

Bigg, M.A., G.M. Ellis, J.K.B. Ford, and K.C. Balcomb. 1987. Killer whales: a study of their identification, genealogy, and natural history in British Columbia and Washington State. Phantom Press, Nanaimo, B.C.

Bisson, P.A. and R.E. Bilby. 1982. Avoidance of suspended sediment by juvenile coho salmon. North American Journal of Fisheries Management 2:371-374.

Bonneau, J.L. and D.L. Scarnechia. 1996. Distribution of juvenile bull trout in a thermal gradient of a plunge pool in Granite Creek, Idaho. Transactions of the American Fisheries Society 125: 628-630.

Bowlby, C.E., G.A. Green, and M.L. Bonnell. 1994. Observations of leatherback sea turtles offshore of Washington and Oregon. Northwest Naturalist. 75:33-35.

Buchanan, D.V. and S.V. Gregory. 1997. Development of water temperature standards to protect and restore habitat for bull trout and other cold water species in Oregon. Pages 119-126 in Mackay, W.C., M.K. Brewin, and M. Monita, editors. Friends of the bull trout conference proceedings. Bull Trout Task Force (Alberta), c/o Trout Unlimited Canada. Calgary, Alberta, Canada.

AGC2C000528

Center for Biological Diversity. 2001. Petition to list the southern resident killer whale (Orcinus orca) as an endangered species under the Endangered Species Act. Center for Biological Diversity, Berkeley, CA.

City of Seattle. 2001. Seattle's Aquatic Environments: Duwamish Estuary. http://www.ci.seattle.wa.us/salmon/docs/9 Duwamish 51-78.pdf.

Cordell, J.R., L.M. Tear, K. Jensen, and H.H. Higgins. 1998. Duwamish River Coastal America restoration and reference sites: Results from 1997 monitoring studies, draft. University of Washington, School of Fisheries, Fisheries Resource Institute, FRI-UW-9416. Seattle, Washington.

Cordell, J.R., L.M. Tear, K. Jensen, and V. Luiting. 1997. Duwamish River Coastal America restoration and reference sites: Results from 1996 monitoring studies. University of Washington, School of Fisheries, Fisheries Resource Institute, FRI-UW-9709. Seattle, Washington.

Emmett, R.L., G.T. McCabe Jr., and W.D. Muir. 1988. Effects of the 1980 Mount St. Helens eruption on Columbia River estuarine fishes: implications for dredging in northwest estuaries. Pages 75-91 in C.A. Simenstad, ed. Effects of Dredging on Anadromous Pacific Coast Fishes. University of Washington, Seattle, Washington.

Ford, J.K.B., G.M. Ellis, L.G. Barrett-Lennard, A.B. Morton, R.S. Palm, and K.C. Balcomb. 1998. Dietary specialization in two sympatric populations of killer whales (*Orcinus orca*) in coastal British Columbia and adjacent waters. Canadian Journal of Zoology 77: 2000.

Gisiner, R.C. 1985. Male territorial and reproductive behavior in Steller sea lion. *Eumetopias jubatus*. Ph.D. Thesis, U. California, Santa Cruz. 145pp.

Goetz, F.A., E. Jeanes, E. Beamer. 2004. Bull Trout in the Nearshore, Preliminary Draft Prepared for the U.S. Army Corps of Engineers, Seattle District. June 2004.

Hart, J.L. 1973. Pacific fishes of Canada. Fisheries Research Board of Canada, Bulletin 180, Ottawa, Canada.

Havis, R.N. 1988. Sediment resuspension by selected dredges. EEDP-09-2. U.S. Army Engineer Waterways Experiment Station. Vicksburg, Mississippi.

Healey, M.C. 1982. Juvenile Pacific salmon in estuaries: the life support system. In Estuarine Comparisons. Edited by V.S. Kennedy. Academic Press, New York. pp. 315-341.

Healey, M.C. 1991. Life history of chinook salmon (*Oncorhynchus tshawytscha*). In Pacific Salmon Life Histories. Edited by C. Groot and L. Margolis. UBC Press, Vancouver. pp. 311-393.

Herman, L.M. 1991. What the Dolphin Knows, or Might Know, in its Natural World. In: K.W. Pryor and L.S. Norris (Eds.), Dolphin Societies: Discoveries and Puzzles, Berkeley, University of California Press, pp. 349-363.

Hotchkiss, Douglas A. 2000. Personal communication of September 14, 2000. Port of Seattle. Seattle, Washington.

Jones, R.E. 1981. Food habits of smaller marine mammals from northern California. Proc. Nat. Acad. Sci. 42:409-433.

Jones & Stokes Associates, Inc. 1990. Post-construction project assessment report, Terminal 91 mitigation monitoring study, 1990. Prepared for the Port of Seattle. Seattle, Washington.

Jones, R.E. 1981. Food habits of smaller marine mammals from northern California. Proceedings of the California Academy of Science 42:409-433.

Kerwin, J. and T. S. Nelson (eds.). 2000. Habitat Limiting Factors and Reconnaissance Assessment Report, Green/Duwamish and Central Puget Sound Watersheds (WRIA 9 and Vashon Island). Washington Conservation Commission and King County Department of Natural Resources.

LaSalle, M.W. 1988. Physical and chemical alterations associated with dredging: an overview. Pages 1-12 in C.A. Simenstad, ed. Effects of dredging on anadromous Pacific coast fishes. University of Washington, Seattle, Washington.

Lee, D.C., J.R. Sedell, B.E. Rieman, R.F. Thurow, J.C. Williams and others. 1997. Chapter 4: Broadscale Assessment of Aquatic Species and Habitats. In T.M. Quigley and S.J. Arbelbide editors. An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins Volume III. U.S. Department of Agriculture, Forest Service, and U.S. Department of Interior, Bureau of Land Management, Gen Tech Rep PNW-GTR-405.

LeGore, R.S., and D.M. Des Voigne. 1973. Absence of acute effects on threespine sticklebacks (*Gasterosteus aculeatus*) and coho salmon (*Onchorynchus kisutch*) exposed to resuspended harbor sediment contamination. Journal of the Fisheries Research Board of Canada 30(8): 1240-1242.

Martin, J.D., E.O. Salo, and B.O. Snyder. 1977. Field bioassay studies on the tolerance of juvenile salmonids to various levels of suspended solids. University of Washington School of Fisheries Research Institute. Seattle, WA. FRI-UW-7713.

Meyer, J.H., T.A. Pearce and S.B. Patton. 1981. Distribution and food habits of juvenile salmonids in the Duwamish estuary, Washington, 1980. Prepared for the U.S. Army Corps of Engineers, Seattle District, Seattle, Washington, by the U.S. Fish and Wildlife Service. Olympia, Washington.

Mortensen, D.G., B.P. Snyder, and E.O. Salo. 1976. An analysis of the literature on the effects of dredging on juvenile salmonids. University of Washington. Fisheries Research Institute, FRI-UW-7605.

National Marine Fisheries Service (NMFS). 1992. Report to Congress on Washington State Marine Mammals. Silver Spring, Maryland.

National Marine Fisheries Service (NMFS). 1998. Essential Fish Habitat West Coast Groundfish Appendix. NMFS, Seattle, Washington.

National Marine Fisheries Service. 1999. Leatherback Sea Turtle. Office of Protected Resources web page, http:nmfs.gov/prot_res/turtles/leathtur.html. 1315 East-West Highway, Silver Spring, Maryland 20910.

National Marine Fisheries Service (NMFS). 2004. Puget Sound Chinook Harvest Resource Management Plan Draft Environmental Impact Statement. Prepared by the National Marine Fisheries Service with assistance from The Puget Sound Treaty Tribes and Washington Department of Fish and Wildlife. April 2004.

Morton, A.B. 1990. A quantitative comparison of the behavior of resident and transient forms of the killer whale off the central British Columbia coast. Reports of the International Whaling Commission Special Issue 12: 245-248.

Noggle, C.C. 1978. Behavioral, physiological and lethal effects of suspended sediment on juvenile salmonids. Master's thesis. University of Washington, Seattle, Washington.

Olesiuk, P., M. Bigg, G. Ellis, S. Crockford and R. Wigen. 1990. An assessment of the feeding habits of harbor seals (*Phoca vitulina*) in the Strait of Georgia, British Columbia, based on scat analysis. Canadian Technical Report of Fisheries and Aquatic Sciences No. 1730.

Orca Network. 2005. http://www.orcanetwork.org/sightings/reportpage.html

Osborne, R. 1988. Marine mammals of greater Puget Sound. The Whale Museum. Seattle, Washington.

Osborne, R.J., J. Calambokidis, and E.M. Dorsey. 1998. A guide to marine mammals of greater Puget Sound. Island Publishers, Anacortes, Washington. 191 pp.

Pacific International Engineering and Pentec Environmental. 1999. Biological Evaluation, East Waterway Channel Deepening, Stage 1, Seattle Harbor, Washington. Prepared for the Port of Seattle. Seattle, Washington.

Palermo, M.R., J.M. Brannon, M.E. Zappi, J.G. Skogerboe, S.A. Adamec, T.C. Sturgis, R. Wade, D. Gunnison, and T.E. Myers. 1986. Dredged material disposal design requirements for U.S. Navy Homeport at Everett, Washington. U.S. Army Corps of Engineers Waterways Experimental Station, Vicksburg, Mississippi.

Palermo, M.R., J.H. Homziak, and A.M. Teeter. 1990. Evaluation of clamshell dredging and barge overflow, Military Ocean Terminal, Sunny Point, North Carolina. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg Mississippi. March, 1990.

Parametrix, Inc. 1990. Terminal 107 (Kellogg Island) Biological Assessment, Port of Seattle – 1989. Prepared for the Port of Seattle Engineering Department. Seattle, Washington.

Parametrix, Inc. 1996. Addendum to Appendix F-5, Biological Assessment, Southwest harbor cleanup and redevelopment project final environmental impact statement. Prepared for the Port of Seattle. Seattle, Washington.

Perry, S.L, D.P. DeMaster, and G.K. Silber. 1999. Special Issue: The great whales: History and status of six species listed as endangered under the U.S. Endangered Species Act of 1973. Marine Fisheries Review 61(1).

PFMC. 1998a. The Pacific Coast Groundfish Fishery Management Plan. Pacific Fisheries Management Council, Portland, Oregon.

PFMC. 1998b. Coastal Pelagics Fishery Management Plan. Pacific Fisheries Management Council, Portland, Oregon.

PFMC. 1999. Appendix A. Identification and Description of Essential Fish Habitat, Adverse Impacts, and Recommended Conservation Measures for Salmon. PFMC, Portland, Oregon. 146 pgs.

Pitcher, K.W. 1981. Prey of Steller sea lion, *Eumetopias jubatus*, in the Gulf of Alaska. U.S. Nat. Mar. Fish. Serv. Fish. Bull. 79(3):467-472.

Pitcher, K.W. and F.H. Fay. 1982. Feeding by Steller sea lions on harbor seals. Mar. Fish. Rev. 63:70-71.

PSAMP and WDFW. 2004. Winter 1993-2004 Aerial Survey Map and Summer 1992-1999 Aerial Survey Map.

PSDDA. 1988. Final Environmental Impact Statement – unconfined open-water disposal sites for dredged material disposal, Phase I (Central Puget Sound). Prepared by the Corps of Engineers in cooperation with the Environmental Protection Agency and the Washington Department of Ecology and Natural Resources. Seattle, WA.

R2 Resource Consultants. 2001. Mainstem Middle Green River Bull Trout Surveys. Draft report prepared for the Corps Seattle District by R2 Resource Consultants. December 2001.

R2 Resource Consultants. 2000. Port of Seattle fish migration studies: Pier 66 short-stay moorage facility. Prepared for Port of Seattle. June, 2000.

Ratliff, D.E. 1992. Bull trout investigations in the Metolius River-Lake Billy chinook system. Pages 37-44 in P.J. Howell and D.V. Buchanan, editors. Proceedings of the Gearhart Mountain bull trout workshop. Oregon Chapter of the American Fisheries Society. Corvallis, Oregon.

Redding, M. J., C.B. Schreck, and F.H. Everest. 1987. Physiological effects on coho salmon and steelhead of exposure to suspended solids. Trans. of the Am. Fish. Soc. 116:737-744.

Rieman, B.E. and J.D. McIntyre. 1993. Demographic and Habitat Requirements for conservation of Bull Trout. Gen. Tech. Rep. INT-302. Ogden, UT: U.S. Department of Agriculture, Forest Service, And Intermountain Research Station. Boise, Idaho. 38p.

Salo, E.O. 1969. Final report for the period June 1, 1965-September 30, 1968, Estuarine Ecology Research Project. University of Washington, Fisheries Research Institute. Seattle, Washington.

Salo, E.O, N.J. Bax, T.E. Prinslow, C.J. Whitmus, B.P. Snyder, and C.A. Simenstad. 1980. The effects of construction of naval facilities on the outmigration of juvenile salmonids from Hood Canal, Washington. FRI-UW-8006. University of Washington College of Fisheries, Fisheries Research Institute. April 1980.

Salo, E.O., T.E. Prinslow, R.A. Campbell, D.W. Smith, and B.P. Snyder. 1979. Trident dredging study: the effects of dredging at the U.S. naval submarine base at Bangor on outmigrating juvenile chum salmon, *Oncorhynchus keta*, in Hood Canal, Washington. Fisheries Research Institute, FRI-UW-7918, College of Fisheries, University of Washington, Seattle.

Servizi, J.A. 1988. Sublethal Effects of Dredged Sediments on Juvenile Salmonids. Pages 57-63 in C.A. Simenstad, ed. Effects of dredging on anadromous Pacific coast fishes. University of Washington, Seattle, Washington.

Servizi, J.A. and D.W. Martens. 1987. Some effects of suspended Fraser River sediments on sockeye salmon (*Oncorhynchus nerka*). Page 254-264 in H.D. Smith, L. Margolis, and C.C. Wood, eds. Sockeye salmon (*Oncorhynchus nerka*) population biology and future management. Can. Spec. Publ. Fish. Aquat. Sci. 96.

Servizi, J.A., and D.W. Martens. 1992. Sublethal responses of coho salmon (*Oncorhynchus kisutch*) to suspended sediments. Can. J. Fish. Aquat. Sci. 49:1389-1395.

Simenstad, C.A., B.S. Miller, J.N. Cross, K.L. Fresh, S.N. Steinfort, and J.C. Fegley. 1979. Nearshore fish and macroinvertebrate assemblages along the Strait of Juan de Fuca, including food habits of nearshore fish. NOAA Tech. Memo. ERL-MESA-20. U.S. Department of Commerce. Boulder, Colorado. 144pp.

Simenstad, C.A. 1988. Effects of dredging on anadromous Pacific Coast fishes. Workshop Proceedings Sept 8-9, 1988. University of Washington, Seattle, Washington.

Simenstad, C.A., J.R. Cordell, R.C. Wissmar, K.L. Fresh, S. Schroder, M. Carr, and M. Berg. 1988. Assemblages structure, microhabitat distribution, and food web linkages of epibenthic crustaceans in Padilla Bay National Estuarine Research Reserve, Washington. NOAA Technical Report Series OCRM/MEMD. FRI-UW-8813. University of Washington, Seattle.

Stalmaster, M.V. and J.R. Newman. 1979. Perch-site preferences of wintering bald eagles in northwest Washington. Journal of Wildlife Management. 43:221-224.

Stober, Q.J., B.D. Ross, C.L Melby, P.A. Dimmel, T.H. Jagielo, and E.O. Salo. 1981. Effects of Suspended Sediment on Coho and Chinook Salmon in the Toutle and Cowlitz Rivers. FRI-UW-8124. University of Washington College of Fisheries, Fisheries Research Institute. November 1981.

Sustainable Ecosystems Institute. March 1997. Seabird Surveys in Puget Sound 1996, Report to Northwest Indian Fisheries Commission. Obtained from Internet November 8, 1999; http://sei.org.survey.htm.

Taylor, W.J., D.K. Shreffler and J.R. Cordell. 1999. Alternative dredge disposal sites: juvenile salmonid and epibenthic prey assessment. Technical Report – Preliminary Draft. Prepared for the Port of Seattle by Taylor Associates. January 15, 1999.

U.S. Fish and Wildlife Service (USFWS). 1986. Recovery plan for the Pacific bald eagle. U.S. Fish and Wildlife Service, Portland, Oregon. 160 pp.

Warner, E.J., and R.L. Fritz. 1995. The distribution and growth of Green River chinook salmon (*Oncorhynchus tshawytscha*) and chum salmon (*Oncorhynchus keta*) outmigrants in the Duwamish Estuary as a function of water quality and substrate. Muckleshoot Indian Tribe Fisheries Dept. Water Resource Division.

Washington Department of Fisheries (WDF). 1992. Salmon, Marine Fish and Shellfish Resources and Associated Fisheries in Washington's Coastal and Inland Marine Waters. Technical Report No. 79 (revised). 70 pgs.

Washington State Department of Ecology. 2004. SEDQUAL (Sediment Quality Information System) Database version 5.0, October 2004. Olympia, Washington.

Washington Department of Wildlife (WDW). 1993. Status of the Steller (northern) sea lion (*Eumetopias jubatus*) in Washington. Draft unpubl. rept. WDW, Olympia, Washington.

Weitkamp, D.E. and R.F. Campbell. 1980. Port of Seattle Terminal 107 fisheries study. Port of Seattle, Planning and Research Department. Seattle, Washington.

Weitkamp, D.E. and G.T. Ruggerone. 2000. PRELIMINARY REVIEW DRAFT: City of Seattle factors affecting chinook populations. Prepared for City of Seattle by Parametrix, Inc., Natural Resources Consultants, Inc., and Cedar River Associates.

Weitkamp, D.E., and T.H. Schadt. 1982. 1980 Juvenile salmonid study. Document no. 82-0415-012F. Prepared by Parametrix, Inc., Seattle, Washington, for the Port of Seattle. Seattle, Washington.

Weston, Roy F., Inc. 1999. Site inspection report, lower Duwamish River (RK 2.5 to 11.5), Seattle, Washington. Volume 1• report and appendices. Prepared for EPA Region 10. EPA document control no. 4000-19-38-AAAL. Seattle, Washington. April 1999.

Whitman, R.P., T.P. Quinn, and E.L. Brannon. 1982. Influences of suspended volcanic ash on homing behavior of adult chinook salmon. Transactions of the American Fisheries Society 111:63-69.

Appendix A

Essential Fish Habitat

ESSENTIAL FISH HABITAT

Essential Fish Habitat Background

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSFMCA) and the 1996 Sustainable Fisheries Act (SFA) an Essential Fish Habitat (EFH) evaluation of impacts is necessary for activities that may adversely affect EFH. EFH is defined by the MSFCMA in 50 CFR 600.905-930 as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Further definitions include:

Waters: Aquatic areas and associated physical, chemical, and biological properties that are used by fish.

Substrate: Sediment, hard bottom, structures underlying the waters, and associated biological communities.

Necessary: The habitat required to support a sustainable fishery and managed species' contribution to a healthy ecosystem.

Estuaries of Washington State, including Puget Sound and the Pacific Ocean off the mouth of these estuaries are designated as EFH for various groundfish and coastal pelagic species (PFMC 1998a and 1998b). A detailed discussion of EFH for groundfish is provided in the Final Environmental Assessment/Regulatory Impact Review for Amendment 11 to The Pacific Coast Groundfish Fishery Management Plan (PFMC 1998a) and the NMFS Essential Fish Habitat for West Coast Groundfish Appendix (NMFS 1998). A detailed discussion of EFH for Coastal Pelagic species is provided in Amendment 8 to the Coastal Pelagic Species Fishery Management Plan (PFMC 1998b). Salmonid EFH is discussed in Appendix A of Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999).

The objective of this EFH assessment is to describe potential adverse effects to designated EFH for federally managed fisheries species within the action area. It also describes conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the project.

EFH and life history stages for groundfish, pelagic and salmonid species commonly found in Puget Sound estuaries and potentially affected by the project are listed in Table A-1 (NMFS 1998 and WDF 1992).

Table A-1
MSFCMA Managed Species and Life-history Stages
Found in Estuarine Waters of Puget Sound with Designated EFH

Species	Adult	Spawning/ Mating	Juvenile	Larvae	Eggs/ Parturition
Spiny dogfish	X		X		X
California skate	X				
Ratfish	X				
Lingcod			X	X	
Cabezon	X	X	X	?	X
Kelp greenling	X	X	X	X	X
Pacific cod	X	X	X	X	X
Pacific whiting			X		
Sablefish			X		
Black rockfish	X		X		
Bocaccio			?	X	
Brown rockfish	X	?	?	X	
Copper rockfish	X		X	?	
Quillback rockfish	X		X	?	
English sole	X	X	X	X	X
Pacific sanddab				X	X
Rex sole	X				?
Starry flounder	X	X	X	X	X
Pacific Salmon Species					
Chinook salmon	X		X		
Coho salmon	X		X		
Puget Sound pink salmon	X		X		
Coastal Pelagic Species					
Northern anchovy	X	X	X	X	X
Pacific sardine	X				
Pacific mackerel	X				
Market squid	X				

? = uncertain, but attribute may apply to life stage
Table taken from NMFS website, http://www.nwr.noaa.gov/1habcon/habweb/efh/ps estuarine.pdf.

Analysis of Effects on EFH

The assessment of potential impacts from the proposed project to the species' EFH is based on information in the above-referenced documents.

The specific elements of the project that could potentially impact groundfish, pelagic species and salmonid EFH, impact mechanisms, and conservation measures that avoid and minimize impacts are identified in Table A-2.

EFH Conclusion.

Pursuant to the MSFCMA and the SFA, an EFH Assessment has been completed and concludes that the proposed action may affect EFH. Consultation on EFH is requested in conjunction with the ESA consultation. A breakdown of the effect determinations is listed below.

Salmon EFH Determination of Effect

The impacts of the project on salmon EFH are discussed in Table A-2.

The impacts of elevated suspended sediment concentrations associated with dredging would be localized and temporary. Further, because salmonids lack a direct linkage to the benthic food web, the temporary disturbance of subtidal habitat is likely to have a negligible effect on salmonid species. No intertidal or shallow subtidal habitat would be altered as part of the project.

Dredging operations would lead to a localized and temporary increase in turbidity at the project site. Conservation measures, including compliance with the Corps dredging permit conditions (Biological Evaluation Section 2.4.1), would minimize the extent of elevated suspended sediment concentrations.

Conservation measures that avoid and minimize impacts to EFH are incorporated into the project design. Therefore, it is concluded that the proposed project will not adversely affect salmonid EFH.

Table A-2
Affected EFH by Project Element and Proposed Conservation Measures

Project Element	Affected EFH	Impact Mechanism	Conservation Measures
Dredging	A total of approximately 2,925 ft^2 of subtidal habitat would be disturbed.	Dredging would temporarily decrease the productivity and diversity of the subtidal benthic community at the project site. Because of the small dredge area and the nature of the dredged material (recently spilled), this effect would be minimal and discountable. Because pelagic and salmonid species found in Puget Sound primarily occupy mid- to upper-level pelagic waters and are tied to pelagic food webs rather than subtidal benthic food webs, impacts to the benthic community have no direct linkage to EFH for these species. Substrates in the area are not native or heavily colonized and do not contain high-quality habitat for groundfish. However, groundfish could be present in the area.	Compliance with WDFW HPA conditions, including applicable timing restrictions. The project avoids dredging shallow nearshore areas (intertidal and shallow subtidal habitat), which are recognized as important rearing habitats for juvenile salmonids. Dredge operator shall take care not to exceed the authorized dredge cut depth or disturb native sediment. The clamshell bucket shall be completely emptied with each pass of the bucket. The bucket will not be dragged over the bottom to level the cut.
Dredging	Suspended sediment concentrations in water column EFH would be temporarily elevated. Suspension of sediment has the potential to adversely affect water column EFH by reducing DO and resuspend chemical constituents. Suspension of natural substrate material is avoided in this project.	Dredging would cause localized, temporary increases in turbidity at the project site. Elevated suspended sediment concentrations could potentially result in temporary, localized reduction in feeding success, direct mortality, gill damage, stress, increased susceptibility to disease or behavioral responses to groundfish, pelagic and salmonid species (PFMC 1998a, PFMC 1998b, PFMC 1999). In a focused study analyzing the effects of suspended Duwamish River sediments on salmonids, LeGore and Des Voigne (1973) conducted 96-hour bioassays on juvenile coho salmon using re-suspended sediments from five locations from Kellogg Island to the head of the navigation channel. This analysis found that suspended sediment concentrations of 28,800 mg/l (with sediment doses as high as 5 percent wet weight), well above levels expected during dredging, had no acute effects on coho salmon. Salo et al. (1979) reported a maximum of only 94 mg/l of sediment in solution in the immediate vicinity of a working dredge in Hood Canal. Palermo et al. (1986) reported that up to 1.2 percent of sediments dredged by clamshell become suspended in the water column.	Timing restrictions specifying that in-water work must occur when juvenile salmonids are absent or present in very low numbers. Compliance with Corps dredging permit. One foot of spilled material will be left in place to avoid disturbance to possibly contaminated native sediments. To assure that removed material does not exceed the approved dredge depth, clamshell control cables shall be marked with highly visible paint to guide the dredge operator. Dredge operator shall regularly check tide boards and make any necessary changes to operation in order to compensate for changes in tidal elevation. Dredge operator shall lift bucket slowly to facilitate maximum dewatering of the bucket near the water surface to avoid plunging as the bucket is raised to the deck.

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Table A-2
Affected EFH by Project Element and Proposed Conservation Measures

Project Element	Affected EFH	Impact Mechanism	Conservation Measures
Dredging		High concentrations of suspended sediments have the potential to reduce DO levels by exposing nutrients to bacterial breakdown (Mortensen et al. 1976). A model created by LaSalle (1988) demonstrated that even in a situation where the upper limit of expected suspended sediment is reached during dredging operations, DO depletion of no more than 0.1 mg/l would occur at depth. LaSalle (1998) concluded that based on the relatively low levels of suspended material generated by dredging operations and considering factors such as flushing, DO depletion around these activities should be minimal.	If the dredge supervisor observes sediment clinging to the sides of the clamshell bucket, the bucket shall be rinsed in a tank after each grab/dump cycle. The deck barge will have fences to contain dredged material. Hay bales with filter fabric shall be installed to serve as filters wherever the fence is not watertight.
Dredging		The project area lies within a Superfund site and native sediments may contain chemical concentrations that could result in adverse effects on the benthic community. The sediments to be dredged consist entirely of recently spilled material. In addition, because groundfish, salmonid and pelagic species in Puget Sound are mobile, they would be expected to avoid areas where unsuitable conditions exist. For this reason, the adverse effects of turbidity on water column EFH are expected to be minimal.	
Dredging	Water column EFH could be adversely effected by spills from construction equipment.	There is a nominal chance that an unintentional release of fuel, lubricants, or hydraulic fluid from the construction equipment could lead to adverse impacts to groundfish, pelagic or salmonid EFH. In the event of such a spill, groundfish, pelagic and salmonid species would be expected to avoid areas with unsuitable water quality conditions.	The contractor will be required to adhere to conditions of the Corps dredging permit.

Groundfish EFH Determination of Effects

The project would temporarily disturb approximately 2,925 ft^2 of subtidal EFH. The disturbance to the subtidal surface would lead to a temporary decrease in the productivity and diversity of soft bottom groundfish EFH at the project site. This disturbance is a very small fraction of the available soft bottom EFH in the Duwamish Waterway. Previous studies in Puget Sound have demonstrated that the benthic community recolonizes rapidly after disturbance, and the project would not lead to a long-term adverse impact on the benthic community. Further, groundfish species are mobile and are able to distinguish and avoid areas where less desirable habitat conditions exist. In the case of the proposed project, groundfish species would avoid the project area.

The project would not lead to any long-term changes to the physical or biological characteristics of the benthic surface and would have no long-term effect on groundfish EFH.

Conservation measures, as discussed in Table A-2, are incorporated into the project design to avoid and minimize impacts to groundfish EFH. Therefore, it is concluded that the proposed project will not adversely affect groundfish EFH.

Coastal Pelagic EFH Determination of Effects

Pelagic species do not feed on benthic organisms and do not have any direct life history linkage to the subtidal surface. For this reason, the short-term change to the benthic community that would occur as part of the project would have no effect on pelagic EFH.

Turbidity associated with dredging could temporarily affect water column EFH for pelagic species. This disturbance would affect only a small fraction of the water column habitat available in the Duwamish Waterway and Elliott Bay. Conservation measures, including compliance with the Corps dredging permit conditions, would further minimize any adverse effects to pelagic EFH.

With the implementation of these and other conservation measures as discussed above in Table A-2, short-term impacts to water quality would be minimal. The project would lead to no long-term adverse impacts to EFH for pelagic species. Based on the analyses in this document, it is expected that the proposed project will not adversely affect coastal pelagic EFH.

Appendix B

Letter to Corps dated September 17, 2002: Improved Material Handling to Reduce Spillage Into the Water

ASH GROVE

ASH GROVE CEMENT SEATTLE PLANT
3801 EAST MARGINAL WAY SOUTH
SEATTLE, WASHINGTON 98134

September 17, 2002

Suzanne Skadowski
Regulatory Branch
United States Army Corps of Engineers
PO Box 3755
Seattle, WA 98124-3755

Ref: #2001-1-00155 - Ash Grove Cement Company

Re: Improved Material Handling to Reduce Spillage into the Water

Dear Ms Skadowski:

This letter is in response to your request for additional information related to material handling equipment to reduce spillage into the water at Ash Grove Cement Co. The following 3-point program is an elaboration on the data supplied to you in the July 12, 2002, letter from Spearman Engineering. It is our understanding that improvements we have already implemented (item 1 below) will serve as mitigation for the proposed project.

1. Improvements Recently Completed. The following improvements, estimated to have cost more than $165,000, have been implemented over the past 3 months:

A. Improvements to reduce spillage at the barge/dock transfer point at the edge of the barge.

- A larger hopper has been installed. It has a vertical front wall that allows increased barge conveyor extension. The new hopper has also been supplied with skirting to reduce spillage.
- The barge-mounted conveyor has been modified to increase conveyor extension by about 14".

B. New covers have been installed over the dock conveyor to reduce dust emission and spillage from the conveyor during summer months.

C. A new pre-cleaner and secondary cleaner system has been installed on the dock conveyor belt. This will significantly reduce carry back spillage from the dock conveyor belt.

3. Annual Monitoring. Upon completion of the current material recovery project a bathymetry survey of the project site will be conducted. This will be followed with annual bathymetry surveys, which will be compared to the post project survey. If material spillage has not been substantially reduced, additional modifications to the conveyor/off loading system, such as those described below will be implemented.

2. Possible Future Improvements. Modifications to the dock conveyor for purpose of further reducing spillage will be considered if determined necessary after evaluation of the improvements described above. Such evaluation would be the result of annual monitoring. Such modifications could include:

A. Modify the dock conveyor to a barge mounted pivot type, similar to another facility owned by the company.

B. Increase the transitional distance at the dock conveyor tail pulley and reduce belt trough angle in the load zone from 35 to 20 degrees. This would allow for an improved skirt seal in the load zone.

Thank you for your assistance in this matter. Please contact us if you have further questions or require additional information.

Yours truly,

Don Ugelstad

Don Ugelstad - Production Superintendent
Ash Grove Cement Company
Seattle, Washington